Positioning India's Rural Development for International Agribusiness

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Outline

- The Coming Regional and Global Food and Agribusiness Environment
  - Drivers of Global Demand for Food
  - Regional Agricultural Supply Potential
- Top 10 Myths about International Agricultural Markets
- Future Prospects

Global Demand for Food

Projected Population Growth to 2050

(millions)

Region	2015	2050	Change	Percent
World	7,336	9,804	+2,468	+ 34
High Income	1,254	1,310	+ 56	+ 4
Low Income	6,082	8,495	+2,413	+ 40
East & S.E. Asia	2,237	2,411	+ 174	+ 8
South Central Asia	1,903	2,526	+ 623	+ 33
Sub-Saharan Africa	949	2,081	+1,132	+119
Latin America/Carib	630	776	+ 146	+ 23
N. Africa & W. Asia	479	779	+ 300	+ 63

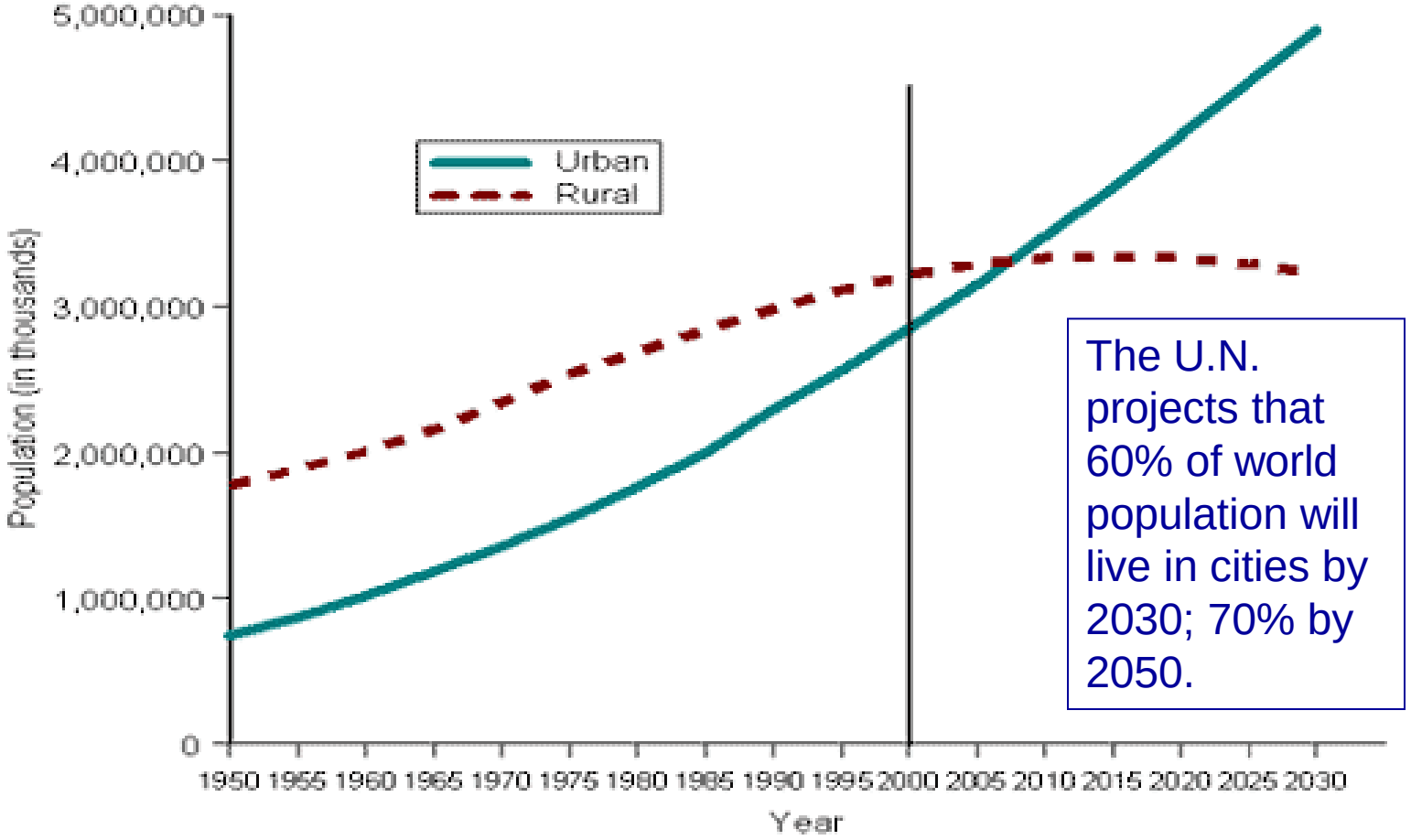
Source: Population Reference Bureau. 2015 World Population Data Sheet.

10 Largest Countries (millions)

2015		2050	
1. China	1,372	1. India	1,660
2. India	1,314	2. China	1,366
3. United States	321	3. United States	398
4. Indonesia	256	4. Nigeria	397
5. Brazil	205	5. Indonesia	366
6. Pakistan	199	6. Pakistan	344
7. Nigeria	182	7. Brazil	226
8. Bangladesh	160	8. Bangladesh	202
9. Russia	144	9. Congo D.R.	194
10. Japan	127	10. Ethiopia	165

Source: Population Reference Bureau. 2015 World Population Data Sheet.

Urbanization Changes Diets: How to Provision Megacities?



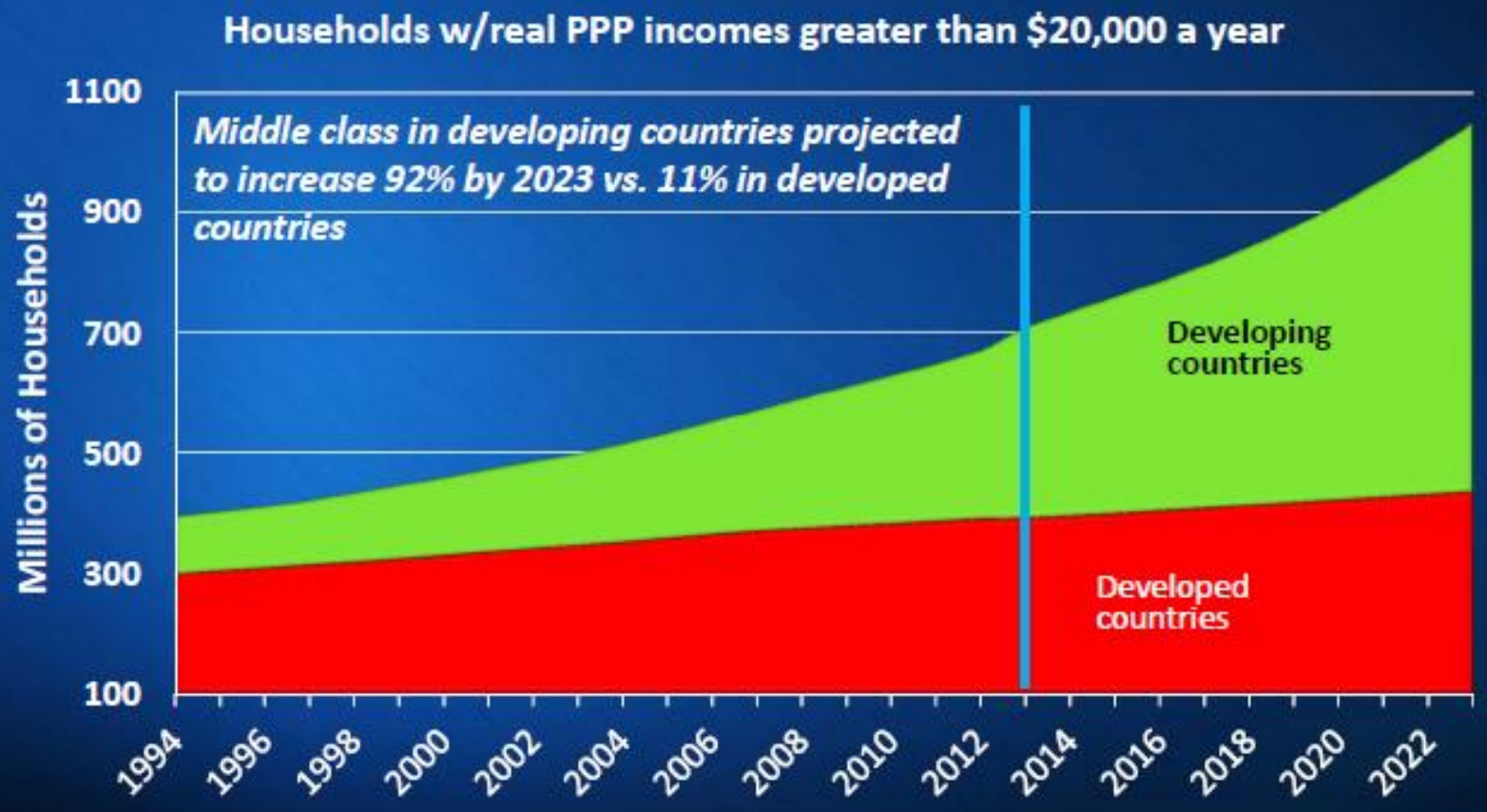
Source:http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK%3A20149913~menuPK%3A34457~pagePK%3A64003015~piPK%3A64003012~theSitePK%3A4607,00.html

Dynamics of Food Demand Growth

- As their incomes rise from about $2 to $10 per day, people can afford a more balanced diet and eat more meat, dairy products, eggs, edible oils, fruits & vegetables causing rapid growth in raw agricultural commodity demand.
- After people's incomes reach about $10/ day, the small part of each increment that gets spent on food is spent on convenience, packaging, processing, variety, and luxury forms, not more raw commodities.

Global "Middle Class" is Expected to Exceed 1 Billion Households by 2023

Most of the increase will be in developing countries, particularly in Asia



Source: IHS Global Consumer Markets data as analyzed by OGA

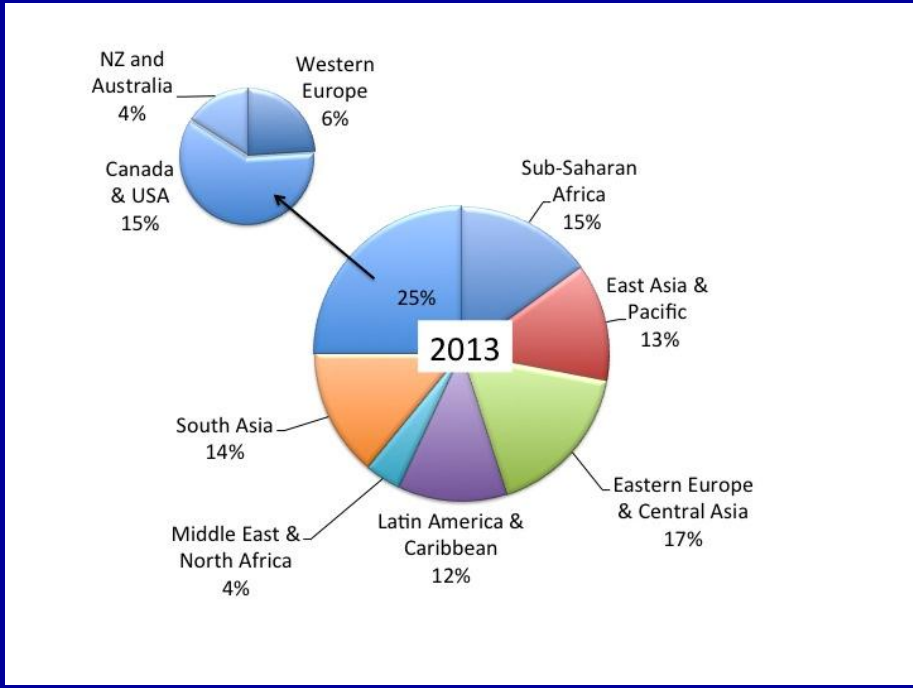
Global Policy Analysis Division
Office of Global Analysis

USDA

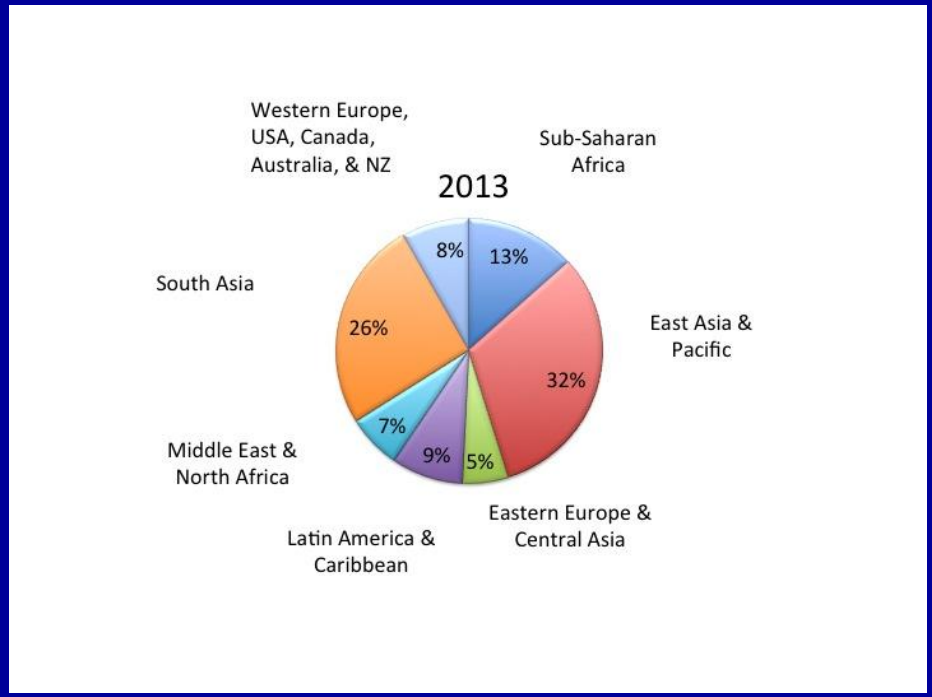
Projected World Food Demand

- World food demand is projected to grow about two-thirds between now and 2050:
  - 33% increase from world population growth – from 7.3 to 9.7 billion – almost all in developing countries
  - 33% increase from broad-based economic growth and urbanization in low income countries
- How many presently low income consumers, who spend the largest fraction of their incomes on food, escape from poverty is the *most important* uncertainty concerning future global demand for food.
- With the growing use of agricultural commodities as raw materials in the of the bio-based economy, including biofuels, world demand for grain and oilseeds could double by 2050.

The world's arable land is not distributed around in the world in the same proportions as is population.



Distribution of Arable Land



Distribution of World Population

East and South Asia have more than twice as much of the world's population than of the arable land, and virtually all of their arable land is already in production. The Middle East & North Africa have land, but not water.

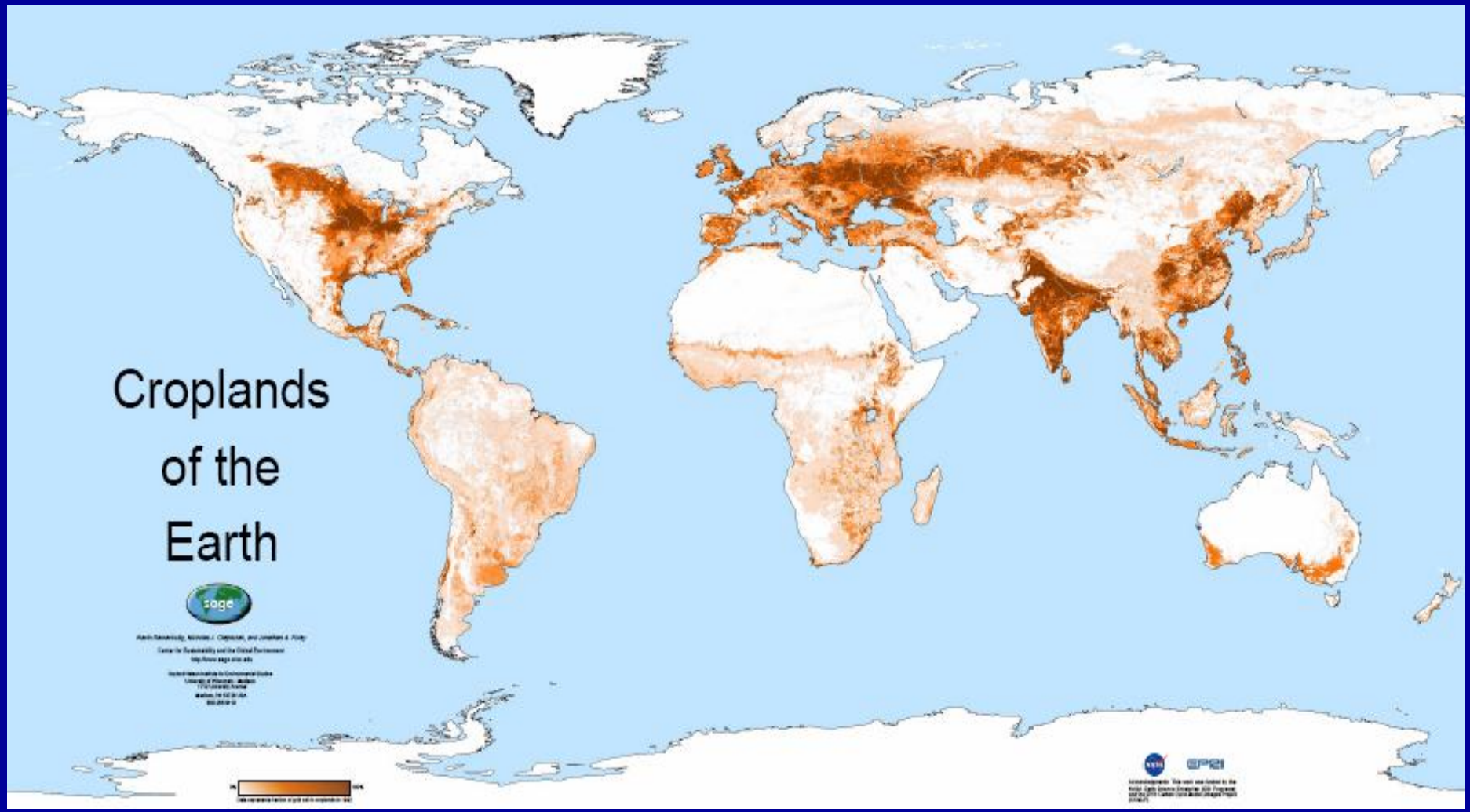
Source: World Bank. World Development Indicators 2013 database and Population Reference Bureau. 2013 Population Datasheet.

Growing Agricultural Trade

- With population growth, urbanization and broad-based economic development, growth in many low-income countries' food consumption is outstripping their production capacity.
- No matter how much they invest in developing their agriculture, many will become larger net importers—on either commercial or concessional terms.
- A larger fraction of world agricultural production is expected to move through world trade.

Global Supply Potential

Croplands of the Earth



Interpretation: The darker the shading, the larger the percent of the land under that pixel that is in crops.
Source: Center for Sustainability and the Global Environment (SAGE), University of Wisconsin.

The Land Constraint

- There is at most 12% more arable land available worldwide that isn't presently forested or subject to erosion or desertification, and…
- Loss and degradation of many soils continues:
  - Urbanization & infrastructure construction
  - Nutrient mining
  - Erosion
  - Desertification
  - Natural reserves
  - Reforestation

The Land Constraint (cont'd.)

- The area of land in farm production could be doubled…
  - But only by massive destruction of forests and loss of wildlife habitat, biodiversity and carbon sequestration capacity
- The only environmentally sustainable alternative is to double productivity on the fertile, non-erodible soils already in crop production.
- Most available cropland is in remote areas of South America and Sub-Saharan Africa where infrastructure is minimal and soils are inferior in quality to many already in production.

Climate Constraints Changing

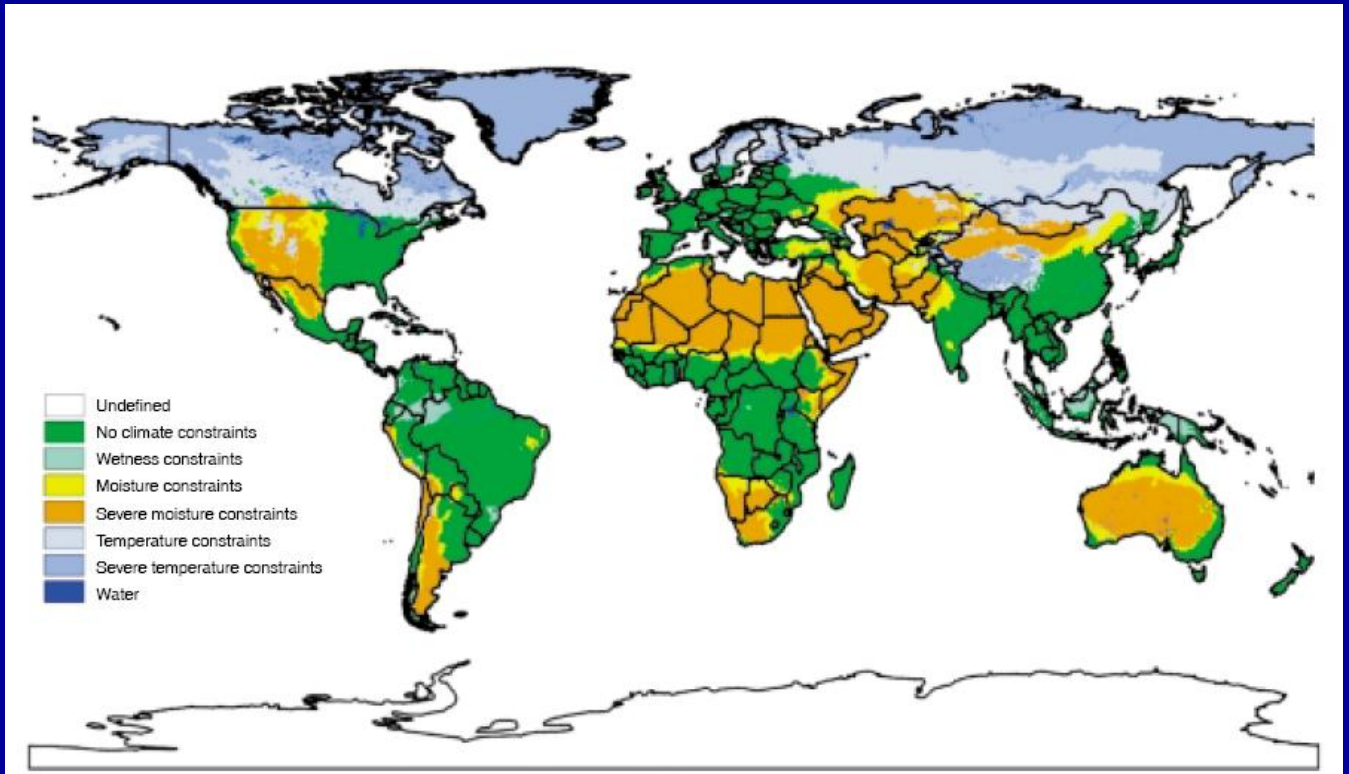


Plate E. Climate constraints.

- Warming greater over land than over water and greatest at higher latitudes.
- Changing spatial distribution of precipitation
- Increased frequency of extreme climatic events

Source: International Institute for Applied Systems Analysis, Laxenburg, Austria.

Adaptations Will be Required Due to Global Climate Change

- As all agro-ecosystems shift with climate change, need larger investments (public and private) in adaptive plant and animal breeding just to sustain present productivity levels.
  - e.g. introduce more drought or heat tolerance.
- Change the mix of what crops are produced in a some geographic locations.
- Rely more on international trade.

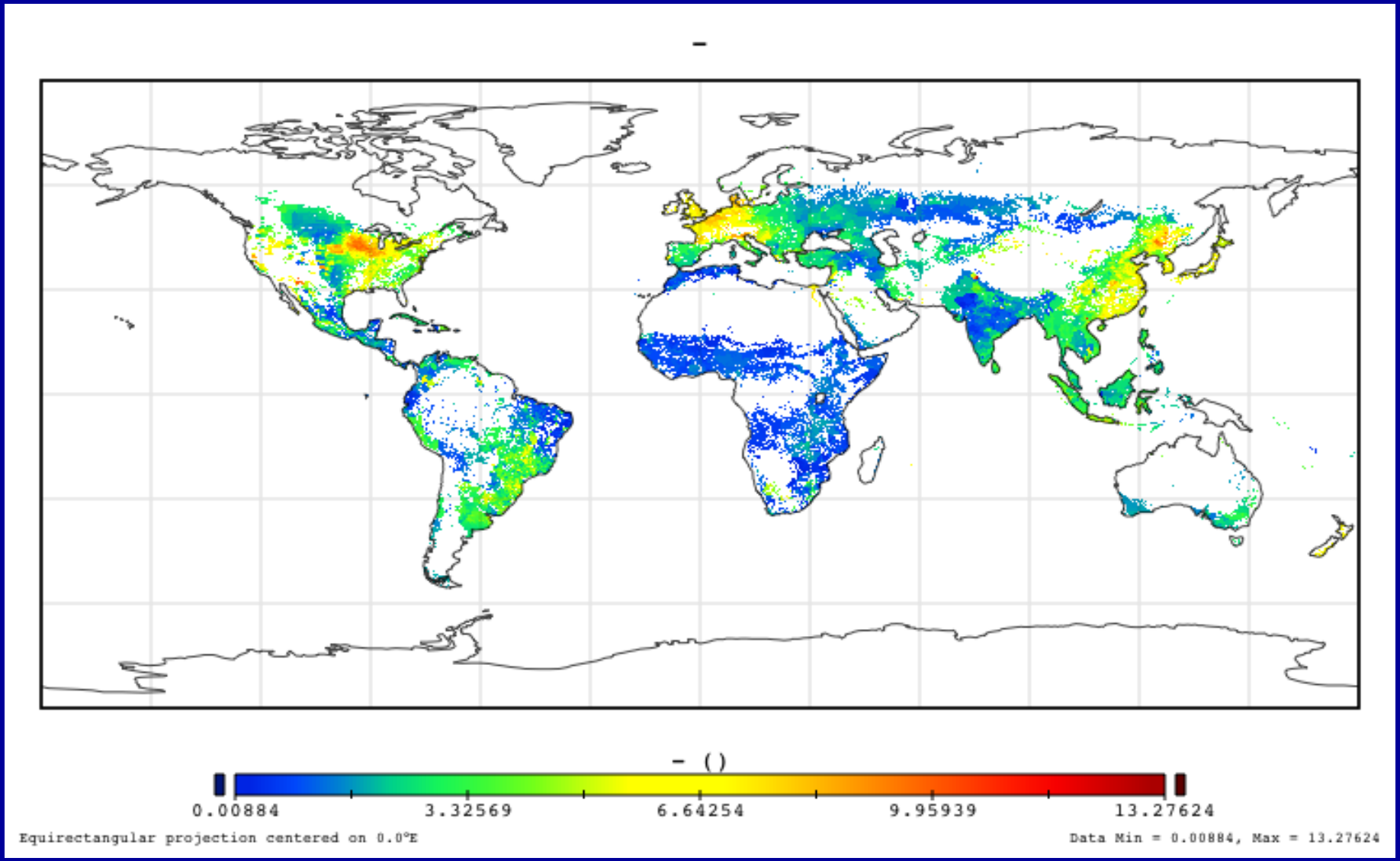
Water--A Growing Constraint

- Farmers account for 70% of the world's fresh water use.
- With the rapid urbanization underway, cities will outbid agriculture for available fresh water.
- The world's farmers, who are being called on to double food production, will have to do it using less fresh water than they are using today.
  - i.e., they will have to more than double the "crop per drop," the average productivity of the water they use.
- This will require investments in research to develop water saving technologies and to increase the drought tolerance and water use efficiency of the crop varieties being grown.

Sustainability Will Require Increased Global Food System Productivity

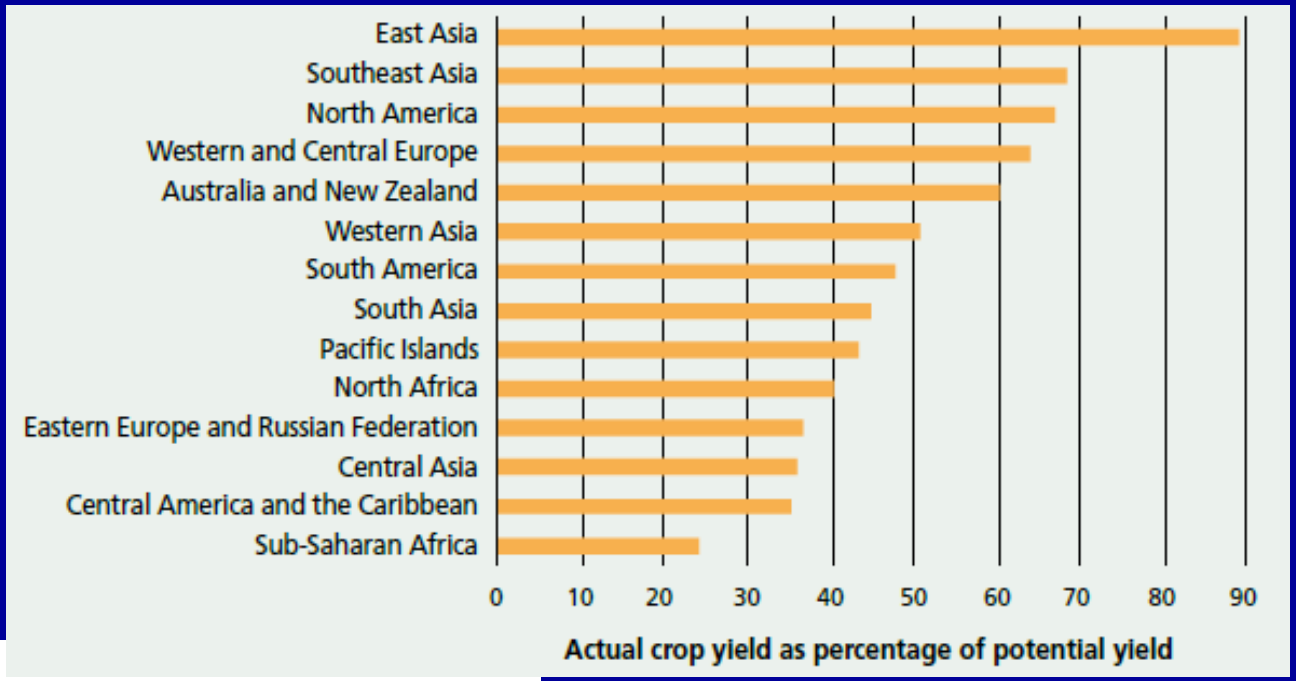
- Make presently unusable soils productive
- Increase genetic potential (of individual crops and/or farming system) (ditto for farm animals)
- Achieve as much of that potential as possible by:
  - Improving nutrition of that crop
  - Increasing water availability and control
  - Reducing competition from weeds for water, nutrients and sunlight
  - Reducing losses from disease and insects
- Reduce post-harvest losses

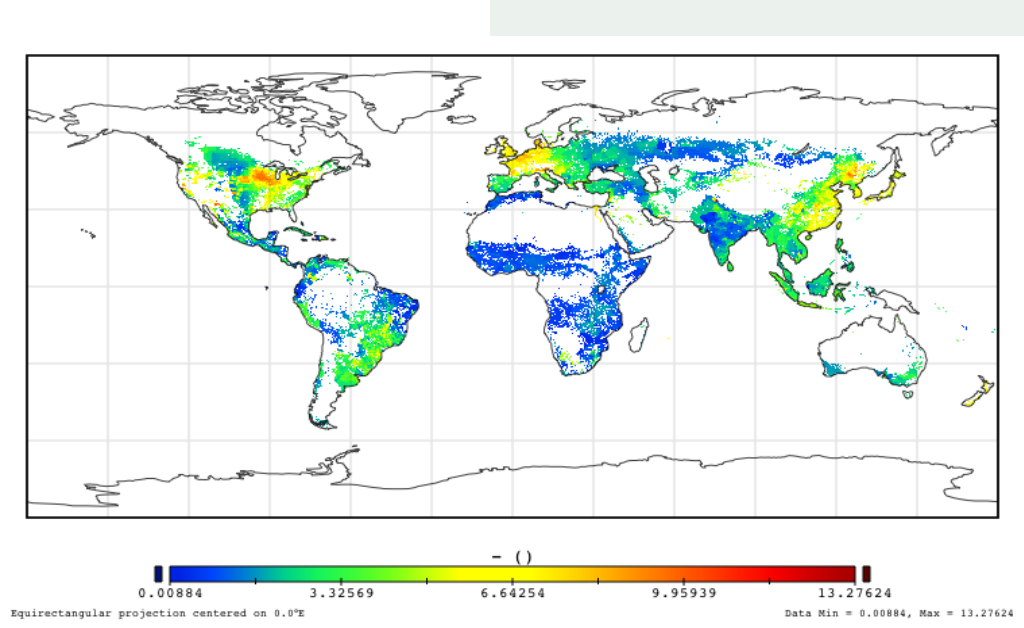
Grain Yields Around the World



Interpretation: Grain yields (in metric tons per hectare) rise from lowest (dark blue) to highest (dark red)
Source: Center for Sustainability and the Global Environment (SAGE), University of Wisconsin.

Crop Yield Gap

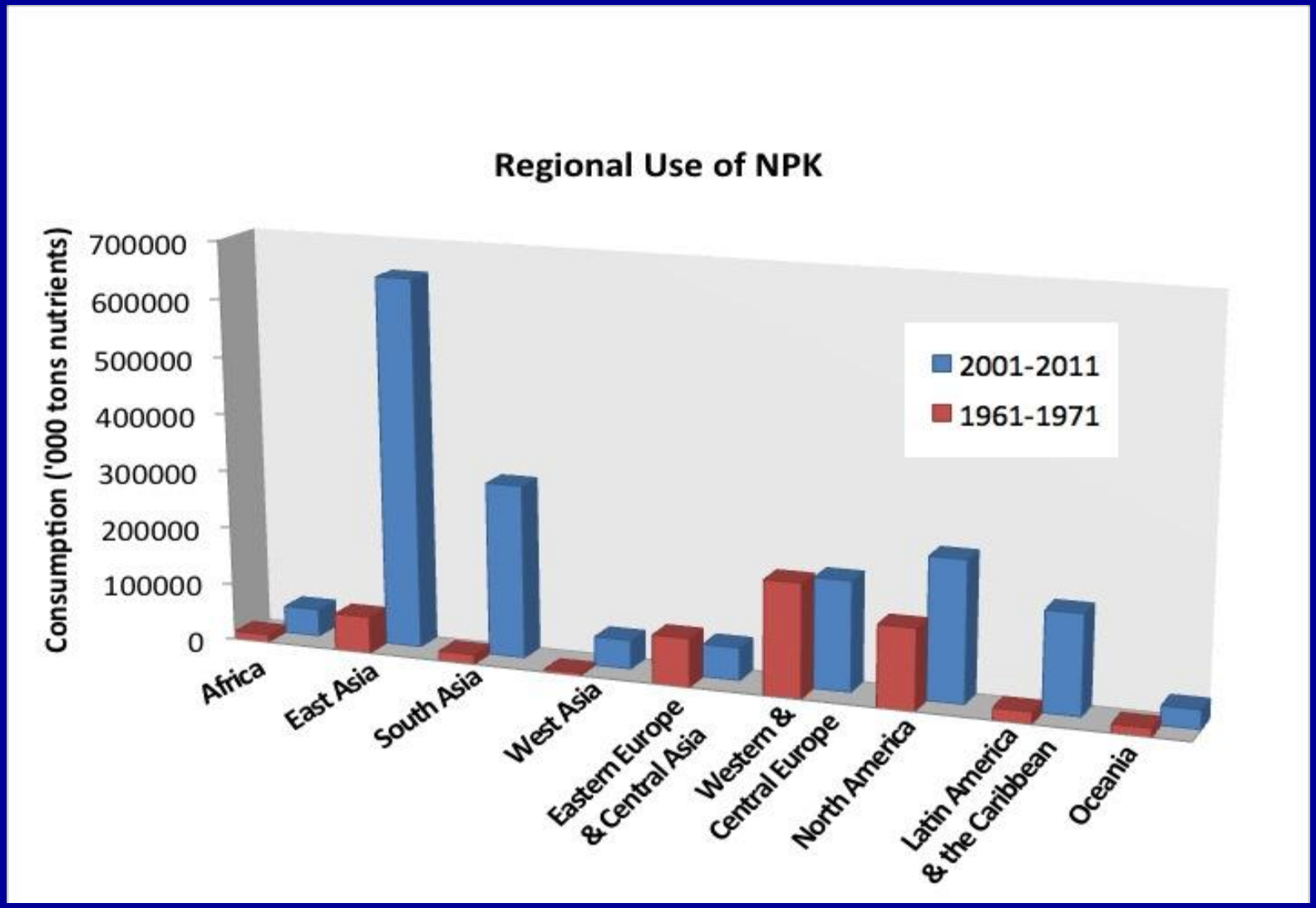




Sources: Center for Sustainability and the Global Environment (SAGE), University of Wisconsin, and FAO. State of Food an Agriculture 2012, p. 106

Fertilizer Use by Region

1961-71 to 2001-2011



Source: FAO data

More Sources of Observed Differences in Grain Yield in Different Locations

- Existence of markets to supply farmers inputs that embody improved technologies (and available credit) and buy their outputs
  - Requires a business friendly investment climate
- Remunerative input and output prices
  - Reflect public policy and state of transport and communications infrastructure.
- Knowledge and skill of farmers.

Agricultural Research Potential

- There remains more productivity enhancement potential from classical plant and animal breeding, especially with modern genomics, and genetic engineering opens new frontiers:, e.g.
  - Improve nutritional content of grains, etc.
  - Increase tolerance to drought, wetness, temperature, salt, aluminum toxicity, …. (to increase yields and/or planted area under adverse or variable conditions)
  - Increase resistance to certain diseases; viruses
  - Reduce pesticide use, especially insecticides
  - Herbicide-resistant varieties
  - Slow down product deterioration

Myth Number 1

Self-sufficiency is the route to national food security.

Corollary: The shorter the distance food is transported between farm and consumer (“food miles”) the better (for the environment).

Why Trade?

- If everything cost the same to produce in every country or region, there would be no basis for trade.
- Increase standard of living by obtaining goods that others can produce at lower cost in exchange for things we can produce relatively cheaper
  - By lowering the cost of living, households' purchasing power stretches further.
  - Increases a country's GDP by employing its land, labor & capital where they are most productive.

Environmental Benefits of Trade

- Avoids environmental degradation that comes with attempting local self-sufficiency by over- exploiting a region's scarce or fragile natural resources.
- Examples:
  - Wind erosion
  - Drawing down aquifers
  - Winter production in hot houses of products that can be produced at lower carbon footprint (inclusive of transport) in warmer places

Myth Number 2

To have a competitive, modern, and prosperous agriculture requires support of agricultural prices, either directly or through import protection.

OECD Producer Support Estimates
(2004, Percent of Gross Receipts)

Switzerland	68
Japan	56
European Union	33
Canada	21
United States	18
Mexico	17
Australia	4
New Zealand	3
30 Countries Overall	30

Source: OECD Agriculture Directorate

Protection and Price Supports

- Supporting market prices is a weak tool for facilitating agricultural development or reducing rural poverty.
- Benefits are distributed in proportion to sales, so the largest farmers get the largest benefits, but they are rarely the people who suffer rural poverty.
  - Over time, these benefits inflate land values, so the ultimate beneficiaries are the largest land owners.
  - Hurt low income consumers who spend the largest fraction of their income on food.

Price Supports Distort Production

- Price supports distort farmers' production decisions towards the products whose prices are supported relatively highest.
  - Can result in wrong products being produced in wrong places, causing environmental damage.
- Direct income support to those who need it, decoupled from production of any specific commodity, distorts less.

That Are Many Essential Roles of Government in Development

- Provide legal environment and public policies that create a positive investment climate, such as
  - Macroeconomic and political stability
  - Rule of law
  - Definition and timely enforcement of contract sanctity
  - Definition of property rights, including ease of registration, transfer and enforcement thereof

Essential Roles of Government in Development (cont'd.)

- Invest in people (human capital)
  - Universal primary school education
  - Quality health care
- Build (or induce others to build) infrastructure
  - Roads and other transportation
    - High cost transportation is a severe impediment
  - Telecommunications
    - Markets do not work well without information
  - Electricity supply

Other Important Roles of Government

- Invest in agricultural research and provide positve climate for private sector to invest in agricultural research
- Consumer protection
  - E.g. food safety; honest weights & measures
- Enforce anti-monopoly laws
- Collection and dissemination of statistics

Myth Number 3

Globalization and agricultural trade liberalization increase poverty.

Globalization and Poverty Reduction

- A more open trading environment *can* stimulate faster economic growth & poverty reduction.
- But for trade liberalization to benefit the LDC poor, need business climate in which private investors create the jobs that are necessary to reduce poverty.
- Many LDCs need foreign assistance (aid for trade) to create the enabling environment, as well as direct foreign investment.

Gains from Trade Liberalization

- Economic theory tells us that the gains of the gainers exceed the losses of the losers
- It does not tell us there are no losers!
- The challenge is to define policy interventions to compensate losers for their losses:
  - to facilitate the adjustment
  - to neutralize opposition of politically powerful opponents who could stop liberalization dead

Myth Number 4

The greatest potential gains to developing countries in the WTO Doha Round agricultural trade negotiations are from reducing domestic agricultural subsidies in high income countries.

Average Producer Support in OECD Countries, 2004, % of Gross Receipts

Rice	75
Sugar	58
Milk	36
Beef & Veal	34
Wheat	33
Corn	31
Oilseeds	27
Pork	21
Overall	30

Source: OECD Agriculture Directorate

World Market Prospects

- Most high income countries' food demand is shrinking
  - Declining populations
  - Aging populations (Older people eat less.)
  - High income consumers don't eat more when their incomes rise further.
- The only potential growth markets are in other developing countries where population & income are growing, i.e. South-South trade.

Larger Fraction of World Food Production to Move Through Trade

- The world's arable land and fresh water are not distributed around in the world in the same proportions as is population.
  - No way for Asia or Middle East to be self-sufficient in food
- With population growth, urbanization and broad-based economic development, many LDCs' food consumption to outstrip their production capacity and they will become larger net importers.
- The greatest potential benefit to developing countries in the Doha Round is increased market access in other developing countries.

Myth Number 5

Globalization and trade liberalization (including regional free trade agreements) hurt rural areas by driving people out of farming.

Rural Poverty Reduction

- Income per capita in rural areas is less than in urban areas in almost all countries of the world.
- No country in the world has solved the problem of rural poverty in agriculture alone.
- Every country that has solved the problem of rural poverty has done it by both increasing agricultural productivity AND creating non-farm employment – both in far away cities, as well as within commuting distance of farmers' residences.

Outmigration Normal & Essential

- Out-migration from agriculture is a normal and essential part of national economic growth, so that both those who leave and those who stay behind in agriculture have the possibility of earning higher incomes.
- Anti-globalization activists often incorrectly assert causality between trade liberalization and changes that occur in rural areas in the normal course of economic development.

Myth Number 6

Only low input (preferably organic) farming is sustainable.

Projected World Food Demand

- World food demand could double by 2050
  - 50% increase from world population growth – all in developing countries
  - 50% increase from broad-based economic growth in low income countries
- How many presently low income consumers are lifted out of poverty will be the *most important* determinant of the future global demand for food.
- The World Bank estimates that the number of people in developing countries living in households with incomes above $16,000 per year will rise from 352 million in 2000 to 2.1 billion by 2030.

The Land Constraint

- There is at most 12% more arable land available that isn't presently forested or subject to erosion or desertification – and degradation of many soils continues.
- The area of land in farm production could be doubled…
- But only by massive destruction of forests and loss of wildlife habitat, biodiversity and carbon sequestration capacity

Water A Growing Constraint

- Farmers use 70% of the fresh water used in the world. They are both the largest users and the largest wasters of water.
- Water is priced at zero to most farmers, signaling that it is much more abundant than in reality. Anything priced at zero will be wasted.
- With rapid urbanization, cities are likely to outbid agriculture for available water.
- The world's farmers need to double food production using less water than today.

The Only Sustainable Way Ahead

- The only environmentally sustainable alternative is to nearly double productivity on the fertile, non-erodible soils already in crop production and perhaps triple the “crop per drop” of fresh water used.
  - Decaying organic matter cannot release enough nutrients to achieve the needed high productivity levels.
  - Farmers will have to have a greater incenetive to used the fresh water they use more efficiently.

Myth Number 7

GMOs are dangerous to human health and the environment.

Is GMO Food Safe to Eat?

- Over 300 million Americans and millions more in Canada, Argentina and Australia have been eating GMO foods for two decades with NOT ONE illness attributable to GMOs.
- Most beer, yogurt and cheese consumed in the world is produced with GMOs already (as are innumerable pharmaceuticals, e.g. immunizations against hepatitis).
- GMO foods are subjected to an unprecedented amount of testing before being put on the market

Academies of Science, International Organizations and Government Agencies Acknowledge Safety of Biotechnology

Academies of Science

- Brazil
- China
- France (both Science and Medicine)
- India
- Italy
- Mexico
- Morocco
- Philippines
- Third World
- United Kingdom (Royal Society)
- United States

Government Agencies

- WHO
- FAO
- AMA
- IFT
- FDA
- EPA
- USDA
- EU Joint Research Council
- EU Food Safety Authority
- AAAS

Environmental Benefits

- Large reduction in insecticide use
- More effective weed control using less energy
- Natural resistance to diseases
- Increase water use efficiency
- Preserve hundreds of millions of hectares of forests
- Reduce pressure on fragile lands

Myth Number 8

If we rely on GMOs for future agricultural technology, profit-maximizing, private sector firms will control the technology through patents and exploit farmers who have no recourse but to buy it from them.

Public vs. Private Biotech Research

- Private sector role in biological ag research only took off after late 1970s when Congress and European parliaments cut appropriations and encouraged private sector to take on this role
- As tools of biotechnology were being developed, governments were reducing investments in ag research – both at home and in their foreign aid
  - The latter often due to strong lobbying by transnational NGOs which now demonize the private sector for controlling most of the biotech-based technology.
- There is nothing inherent in biotechnology that says it must be done by private sector.

Biotechnology Opens New Frontiers

- Improve nutritional content of grains, etc.
- Increase tolerance to drought, wetness, temperature, salt, aluminum toxicity, …. (to increase yields and/or planted area under adverse or variable conditions)
- Internalize resistance to diseases; viruses
- Reduce pesticide use, esp. insecticides
- Herbicide-resistant varieties
- Slow down product deterioration

Two Separable Issues

- The biological research tool of genetic engineering
  - Every national academy of science that has looked at it says biotech plants are neither safer nor less safe than the products of classical plant breeding.
- Who does the research (public vs. private)? Is it patented? Do farmers have to buy inputs (every year) to access the improved technology?
- Failure to recognize that these are completely separate issues confuses a great deal of the debate concerning GMOs.

Intellectual Property Protection

- To satisfy their shareholders, the private sector has to be able to internalize return on its investment in ag research
- If public sector doesn't pay for the agricultural research, farmers must pay for it (both successes and failures) in the price of the inputs they buy *each* year.
- The challenge is how to serve the needs low income farmers in developing countries who cannot afford to pay.

Conclusions on Biotechnology

- Developing countries have greatest need to exploit the power of modern biology to ensure food security
- Genetic engineering will not solve all problems of 21st century agriculture, but it would be unconscionable to deprive the world's poor of the potential benefits to them.

Myth Number 9

Organic food is more nutritious and safer to eat than that produced by conventional agriculture.

Institute of Food Technologists Survey of Scientific Research

"While many studies demonstrate qualitative differences between organic and conventional foods with respect to pesticide residues and nutrients, it is premature to conclude that either food system is superior to the other. Pesticide residues, naturally occurring toxins, nitrites, and polyphenolic compounds exert their health risks or benefits on a dose-related basis, and data currently do not exist to ascertain whether the differences in the levels of such chemicals between organic foods and conventional foods are of health significance."

Journal of Food Science, Nov.-Dec. 2006.

Economic Benefit to Food Retailers

- Consumers who buy organic foods generally say it is because they believe them to be more nutritious and to avoid pesticide residues.
- Retailers like to sell organics (and other niche products like non-GMOs) because they see opportunity for much higher mark-ups.

Myth Number 10

Consolidation and growing firm-size in the food value-chain is hurting farmers by driving down the fraction of consumers' food expenditures that goes to farmers.

Growing Concentration

- Much of international ag commodity trade is carried out by a small number of large multinational firms
  - Each has large investment in infrastructure, market information gathering and risk management capacity.
- Intense competition among 3 or 4 firms is sufficient to keep average profit margins across individual transactions small.

Engel's Law

- The proportion of income spent on food declines as income rises.
- We observe this law:
  - across households within a country
  - across countries at any given time
  - across time for any country.
- Food is a necessity and consumption increases at low income levels. But quickly reach satiation and consumers prefer to spend additional income on convenience, processing, packaging, luxury foods, and other goods than food.

Two Essential Facts

- All food is “organic.”
- No one alive today has ever eaten a mouthful of food that has not been genetically modified.

Thank You.

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